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820.01 General

Signing is a primary mechanism for regulating, warning, and guiding traffic. Signing must be in place when any section of highway is open to the motoring public. Each highway project has unique and specific signing requirements. For statewide signing uniformity and continuity, it is sometimes necessary to provide signing beyond the project limits. Design characteristics of the facility determine the size and legend for a sign. As the design speed increases, larger sign sizes are necessary to provide adequate message comprehension time. The MUTCD, the *Traffic Manual*, and the *Sign Fabrication Manual* contain standard sign dimensions, specific legends, and reflective sheeting types for all new signs. Guide signing provides the motorist with guidance to destinations. This information is always presented in a consistent manner. In some cases, there are specific laws, regulations, and policies governing the content of the messages on these signs. All proposed guide signs for a project require the approval of the region's Traffic Engineer. The use of nonstandard signs is strongly discouraged and their use requires the approval of the State Traffic Engineer.

The Design Matrices identify the design levels for signing on all preservation and improvement projects. These levels are indicated in the column "Signing" for Interstate main line and the column "Signing, Delineation, and Illumination" for all other routes.

Review and update existing signing within the limits of all preservation and improvement projects as indicated in the matrices. Provide standard signing on projects with either a "B"

(basic design level) or "EU" (evaluate upgrade) matrix designation by applying the following criteria to determine the need to replace or modify existing signs:

- Lack of nighttime retroreflectivity.
- Substantial damage, vandalism, or deterioration.
- Age of signs (seven to ten years old).
- A change in sign use policy.
- Improper location.
- Message or destination changes necessary to satisfy commitments to public or local agencies.
- Substandard mounting height.
- Change in jurisdiction, for example a county road becomes a state route.

Address sign support breakaway features when identified in the "Clear Zone" columns of the Matrices. When the "F" (full design level) matrix designation is present, the preceding criteria are still applicable and all existing signing is required to conform to the current policy for reflective sign sheeting requirements. Remove or replace signing not conforming to this policy.

820.02 References

Revised Code of Washington (RCW) 47.36.030, Traffic control devices

Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), USDOT, Washington DC, 1988, including the *Washington State Modifications to the MUTCD*, M 24-01, WSDOT, 1996

Traffic Manual, M 51-02, WSDOT

Sign Fabrication Manual, M 55-05, WSDOT

Standard Plans for Road, Bridge, and Municipal Construction (Standard Plans), M 21-01, WSDOT

Standard Specifications for Road, Bridge, and Municipal Construction (Standard Specifications), M 41-10, WSDOT

Plans Preparation Manual, M 22-31, WSDOT

Directive D 32-20, "State Route Mileposts," WSDOT

820.03 Design Components

(1) Location

The MUTCD contains the guidelines for positioning signs. Check sign locations to ensure that the motorist's view of the sign is not obscured by other roadside appurtenances. Also, determine if the proposed sign will obstruct the view of other signs or limit the motorist's sight distance of the roadway. Reposition existing signs, when necessary, to satisfy these visibility requirements. Where possible, locate signs behind existing traffic barriers, on grade separation structures, or where terrain features will minimize their exposure to errant vehicles.

(2) Longitudinal Placement

The MUTCD and the *Traffic Manual* provide guidelines for the longitudinal placement of signs that are dependent on the type of sign. Select a location to fit the existing conditions to ensure visibility and adequate response time. In most cases, signs can be shifted longitudinally to enhance safety without compromising their intended purpose.

(3) Lateral Clearance

The MUTCD contains minimum requirements for the lateral placement of signs. These requirements are shown in Figures 820-1a and 820-1b. When possible, position the signs at the maximum practical lateral clearance for safety and reduced maintenance costs. Locate large guide signs and motorist information signs beyond the Design Clear Zone, when limited right of way or other physical constraints are not a factor. See Chapter 700. On steep fill slopes, an errant vehicle is likely to be partially airborne from the slope break near the edge of shoulder to a point 3.6 m down the slope. When signs are placed on fill slopes steeper than 1:6, locate the support at

least 3.6 m beyond the slope break. Use breakaway sign support features, when required, for signs located within the Design Clear Zone and for signs located beyond this zone where there is a possibility they might be struck by an errant vehicle. Breakaway features are not necessary on sign posts located behind traffic barriers. Install longitudinal barrier to shield signs without breakaway features within the Design Clear Zone when no other options are available.

Sign bridges and cantilever sign structures have limited span lengths. Locate the vertical components of these structures as far from the traveled way as possible and, where appropriate, install traffic barriers or land forms. See Chapter 710.

Do not locate sign posts in the bottom of a ditch or where the posts will straddle the ditch. The preferred location is beyond the ditch or on the ditch backslope. In high fill areas, where conditions require placement of a sign behind a traffic barrier, consider adding embankment material to reduce the length of the sign supports.

(4) Sign Heights

For ground-mounted signs installed at the side of the road, provide a mounting height of at least 2.1 m, measured from the bottom of the sign to the edge of traveled way. Supplemental plaques, when used, are mounted directly below the primary sign. At these locations, the minimum mounting height of the plaque is 1.5 m.

Do not attach supplemental guide signs to the posts below the hinge mechanism or saw cut notch on multiple post installations. The location of these hinges or saw cuts on the sign supports are shown in the Standard Plans.

A minimum 2.1 m vertical height from the bottom of the sign to the ground directly below the sign is necessary for the breakaway features of the sign support to function properly when struck by a vehicle. The minimum mounting height for new signs located behind longitudinal barriers is 2.1 m, measured from the bottom of the sign to the edge of traveled way. A lower mounting height of 1.5 m may be used when replacing a sign panel on an existing sign assembly located behind longitudinal barrier.

Signs used to reserve parking for people with disabilities are installed at each designated parking stall and are mounted between 0.9 m and 2.1 m above the surface at the sign location. Figures 820-1a and 820-1b show typical sign installations.

(5) Foundations

Foundation details for wood and steel ground mounted sign supports are shown in the Standard Plans. That manual also contains foundation designs for truss-type sign bridges and cantilever sign structures. Three designs, Types 1, 2, and 3, are shown for each structure.

An investigation of the foundation material is necessary to determine the appropriate foundation design. The Type 1 foundation design uses a large concrete shaft and is the preferred installation when the lateral bearing pressure of the soil is 120 MPa or greater. The Type 2 foundation has a large rectangular footing design and is an alternate to the Type 1 foundation when the concrete shaft is not suitable. The Type 3 foundation is used in poorer soil conditions where the lateral bearing pressure of the soil is between 72 MPa and 120 MPa. Use the data obtained from the geotechnical report to select the foundation type.

If a nonstandard foundation or monotube structure design is planned, forward the report to the Bridge and Structures Office for their use in developing a suitable foundation design. See Chapter 510.

(6) Sign Posts

Ground mounted signs are installed on either wood posts, laminated wood box posts, or steel posts. The size and number of posts required for a sign installation are based on the height and surface area of the sign, or signs, being supported. Use the information in Figures 820-2, 820-3, and 820-4 to determine the posts required for each installation. Use steel posts with breakaway supports that are multidirectional if the support is likely to be hit from more than one direction. Design features of breakaway supports are shown in the Standard Plans. Steel posts with Type 2A and 2B bases have multidirectional breakaway features.

820.04 Overhead Installation

Conditions justifying the use of overhead sign installations are noted in the MUTCD. Where possible, mount overhead signs on grade separation structures rather than sign bridges or cantilever supports.

Details for the construction of truss-type sign bridges and cantilever sign supports are shown in the Standard Plans.

The Bridge and Structures Office designs structure mounted sign mountings, monotube sign bridges, and monotube cantilever sign supports. For overhead sign installation designs, provide sign dimensions, horizontal location in relation to the roadway, and the location of the lighting fixtures, to facilitate design of the mounting components by the Bridge and Structures Office.

(1) Illumination

In urban areas, all overhead signs on multilane highways are illuminated. In rural areas, all overhead regulatory and warning signs including guide signs with “Exit Only” panels on both multilane and conventional highways are illuminated. All other overhead signs are only illuminated when one of the following conditions is present:

- Sign visibility is less than 240 m due to intervening sight obstructions such as highway structures or roadside features
- Ambient light from a non-highway light source interferes with the sign’s legibility
- The sign assembly includes a flashing beacon

Sign illumination is provided with sign lighting fixtures mounted directly below the sign. The light source of the fixture is a 175 watt mercury vapor lamp. Provide one sign light for a sign with a width of 4.8 m or less. For wider signs, provide two or more sign lights with a spacing not exceeding 4.8 m. If two or more closely spaced signs are in the same vertical plane on the structure, consider the signs as one unit and use a uniform light fixture spacing for the entire width.

Voltage drops can be significant when the electrical service is not nearby. See Chapter 840 for guidance in calculating electrical line loss.

In areas where an electrical power source is more than 800 m away, utility company installation costs can be prohibitive. Reconsider the benefit of an overhead sign installation at these locations.

(2) Vertical Clearance

The minimum vertical clearance from the roadway surface to the lowest point of an overhead sign assembly is 5.3 m. The maximum clearance is 6.4 m.

(3) Horizontal Placement

Consider roadway geometrics and anticipated traffic characteristics in order to locate signs above the lane, or lanes, to which they apply. Install advance guide signs and exit direction signs that require an EXIT ONLY and “down arrow” panel directly above the drop lanes.

To reduce driver confusion as to which lane is being dropped, avoid locating a sign with an EXIT ONLY panel on a horizontal curve.

(4) Service Walkways

Walkways are provided on structure-mounted signs, truss-type sign bridges, and truss-type cantilever sign supports where the roadway and traffic conditions prohibit normal sign maintenance activities. Normally, monotube sign bridges and cantilever sign supports do not have service walkways.

Vandalism of signs, particularly in the form of graffiti, can be a major problem in some areas. Vandals sometimes use the service walkways. Maintenance costs in cleaning or replacing vandalized signs at these locations can exceed the benefit of providing the service walkway.

820.05 Mileposts

Milepost markers are a part of a statewide system for all state highways and are installed in accordance with the Directive D 32-20, State Route Mileposts.

820.06 Guide Sign Plan

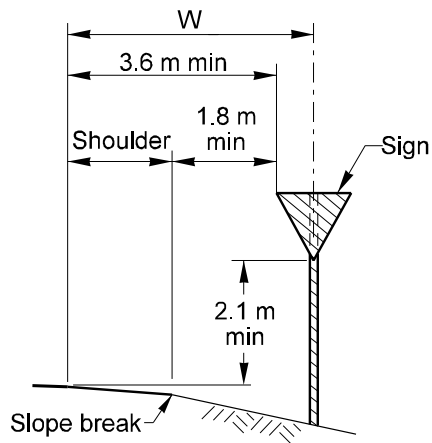
A guide sign plan is used by the region to identify existing and proposed guide signing on state highways. The plan provides an easily understood graphic representation of the signing and allows assessment of the continuity in signing to motorist destinations, activities, and services. It is also used to identify deficiencies or poorly defined routes of travel. A guide sign plan for safety and mobility improvement projects is desirable.

When proposed highway work affects signing to a city or town, the guide sign plan can be furnished to the official governing body for review and consideration. The guide sign plan is reviewed and approved by the region’s Traffic Engineer.

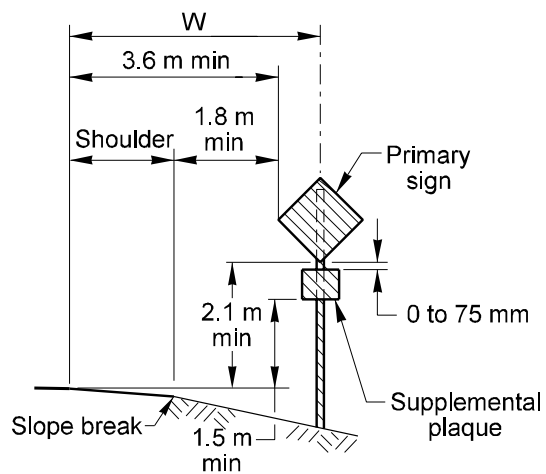
820.07 Documentation

Include the following items in the project file:

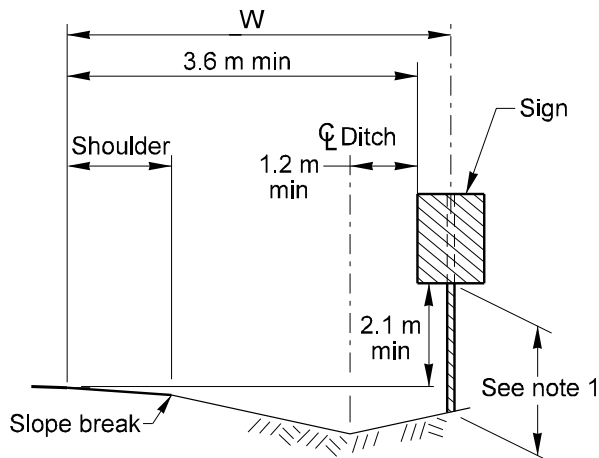
- ☐ An inventory of all existing signing within the project limits
- ☐ Approval of proposed guide signs
- ☐ Approval of non-standard signs
- ☐ Soils investigations for all sign bridge and cantilever sign supports



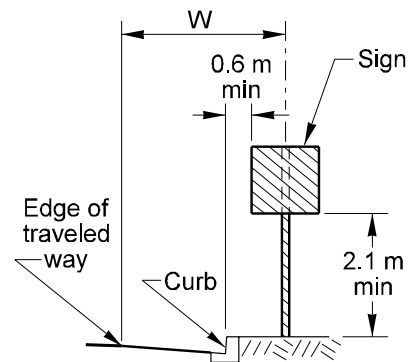
Sign Installation in Fill Section



Sign with Supplemental Plaque Installation in Fill Section



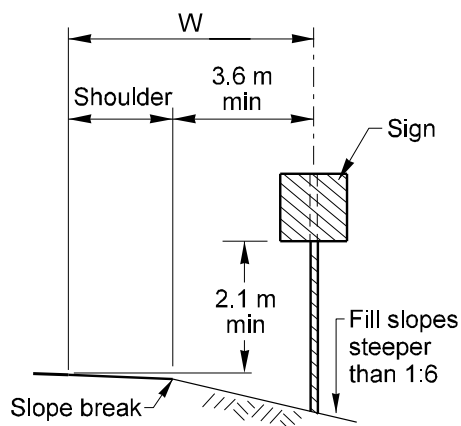
Sign Installation in Ditch section



Sign Installation in Curb Section

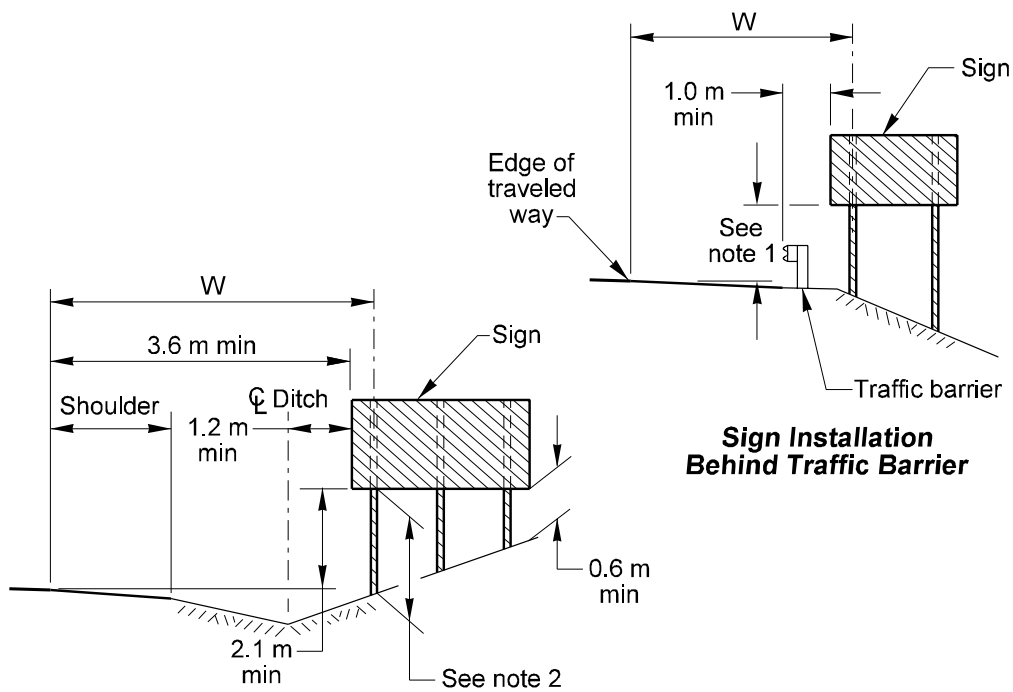
Notes

1. 2.1 m min vertical clearance for sign supports with breakaway features

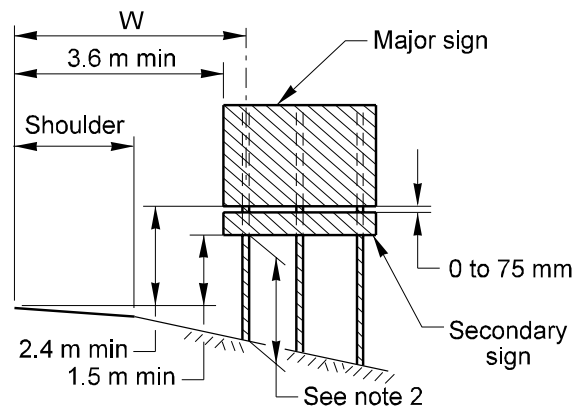


Sign Installation on Steep Fill Slopes

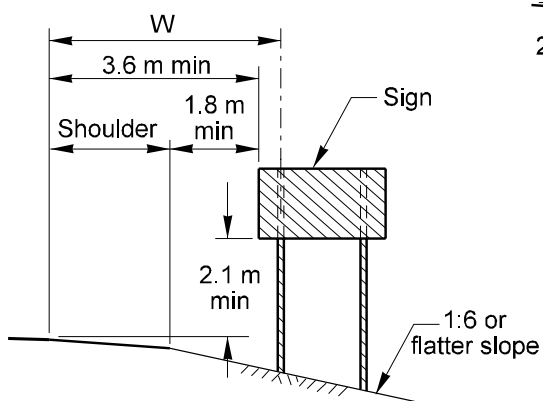
Sign Support Locations
Figure 820-1a



**Multiple Sign Post Installation
in Ditch Section**



**Guide or Directional Sign with
Secondary Sign Installation on
Expressways and Freeways**

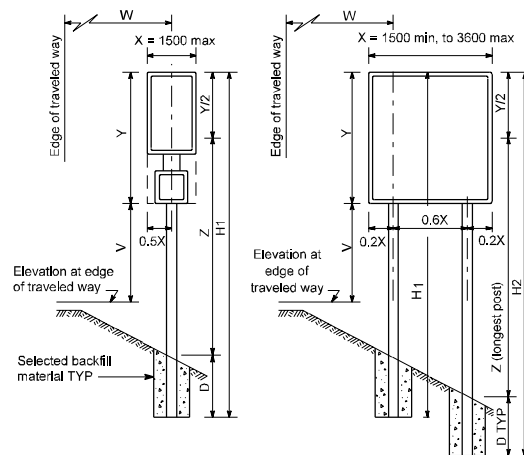


**Multiple Sign Post Installation
in Fill Section**

Notes

1. 2.1 m min for new sign installations
 1.5 m min for existing sign installations
2. 2.1 m min vertical clearance for sign supports with breakaway features

Sign Support Locations
Figure 820-1b



For the purpose of post selection, X and Y are as follows:

Single sign, or back-to-back signs, X and Y are the overall dimensions of the sign.

Multiple sign installations, X and Y are the dimensions of a rectangle enclosing all signs.

Z is the height from ground line to mid-height of sign at the longest post.

H1 + H2, etc., equals overall post length.

D is the required post embedment depth.

V is the vertical clearance from edge of traveled way.

Post size	(X)(Y)(Z) in m ³ **				D
	1 Post	2 Post	3 Post	4 Post	
4x4	1.7*	3.8	5.0	6.6	1.0
4x6	5.0*	10.0	15.0	20.0	1.2
6x6	6.0	12.0	18.0	24.0	1.2
6x8	8.5	24.0	36.3	48.1	1.2
6x10	11.0	33.5	50.1	66.8	1.5
8x10	16.3	45.6	68.3	91.0	1.5
8x12	22.0	65.5	98.1	130.8	1.8

*Single post application utilizing Western Red Cedar has (X)(Y)(Z) allowable of 1.4 and 4.4 respectively.

**Values shown are the maximum permitted. If the quantity (X)(Y)(Z) exceeds the limit for 8X12 posts, use steel post installations.

When sign is to be located in the clear zone or outside of the clear zone, but in an area where it is likely to be struck by an errant vehicle, the following configurations are not permitted:

1. Timber posts larger than 6X8.
2. Signs less than 3.6 m wide and three 6X6 or larger posts.
3. Signs less than 5.1 m wide and four 6X6 or larger posts.

Use steel or laminated wood posts in these situations.

Design Example

Given: 900 wide, 1200 high sign with a 450 wide, 600 high sign mounted 75 below. 2.4 m shoulder with 2% slope and a 1:6 embankment. W = 4500, V=1500.

Solution: Use single post. X=900, Y=1875. Z=1875/2 + (0.02X2400) + 1500 + 2100/6 = 2835. (X)(Y)(Z) = 0.9 mX1.875 mX2.835 m = 4.78 m³. From table, select smallest post having (X)(Z) of 4.78 m³ or more. Use 4X6 post H=Z+Y/2+D=2835+1875/2+1200=4973. Use 6X6 when using Western Red Cedar.

Design Example

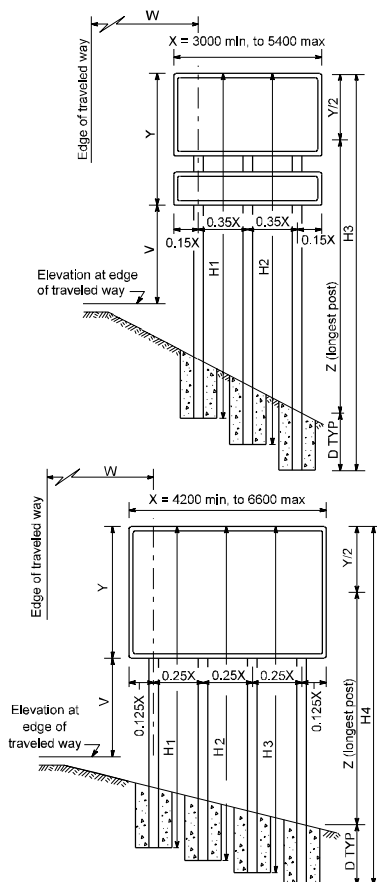
Given: 3000 wide, 1200 high sign, 3.0 m shoulder with 2% slope and a 1:6 embankment. W=10500. V=2100. Assume sign is inside of clear zone.

Solution: Try two posts. X=3000, Y=1200. Z=1200/2+2100+(0.02x3000)/(7500+0.6X3000)/6=4310. (X)(Y)(Z)=3 mX1.2 mX4.31 m=15.52 m³. From table, select smallest post having (X)(Y)(Z) of 15.52 m³ or more. Two 6X6 posts are not sufficient use two 6X8 posts because three 6X6 posts would require a traffic barrier.

$$H2=4310+600+1200=6110$$

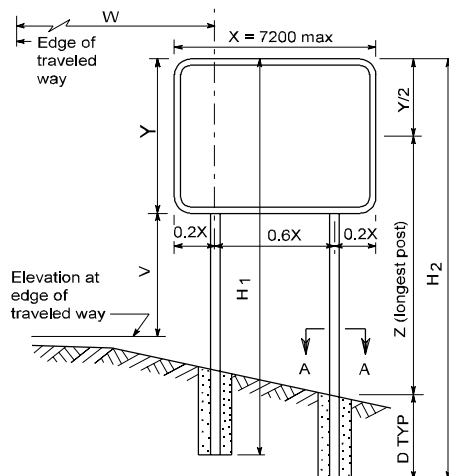
$$H1=6110-(0.6X3000)/6=5810$$

All dimensions are in millimeters (mm) unless otherwise noted.



Wood Posts

Figure 820-2



For the purpose of post selection, X and Y are as follows:

Single sign, or back-to-back signs. X and Y are the overall dimensions to the sign.

Multiple sign installations, X and Y are the dimensions of a rectangle enclosing all signs.

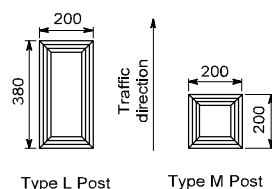
Z is the height from ground line to mid-height of sign at the longest post.

H_1 and H_2 equal overall post length.

D is the required post embedment depth.

V is the vertical clearance from edge of traveled way.

Box Post Type	Z (m)	(X)(Y)(Z) m ³ *
M	4.58 to 9.14	37.66
M	4.57 or less	47.03
L	4.58 to 9.14	99.16
L	4.57 or less	123.97



Type L Post Type M Post

SECTION A-A

Design Example

Given: 4800 wide, 1800 high sign. 3.0 m shoulder with 2% slope and a 1:6 embankment. $W = 7500$, $V = 2100$.

Solution: Use two posts. $X = 4800$, $Y = 1800$.

For two posts: $Z = 1800/2 + 2100 + (0.02 \times 3000) + (4500 + 0.6 \times 4800)/6 = 4.29$ m.
 $(X)(Y)(Z) = 4.8 \text{ m} \times 1.8 \text{ m} \times 4.29 \text{ m} = 37.07 \text{ m}^3$.
 From table, select smallest post having $(X)(Y)(Z)$ of 37.07 m^3 or more, and meets the "Z" requirements.

Use two M posts.

$$H_2 = Z + Y/2 + D = 4.29 \text{ m} + 0.9 \text{ m} + 1.8 \text{ m} = 6.99 \text{ m}.$$

$$H_1 = 6.99 - (0.6 \times 4.8 \text{ m})/6 = 6.51 \text{ m}.$$

Design Example

Given: 5400 wide, 2400 high sign, 3.0 m shoulder with 2% slope and a 1:6 embankment. $W = 7500$, $V = 2100$.

Solution: Use two posts. $X = 5400$, $Y = 2400$.

For two posts: $Z = 2400/2 + 2100 + (0.02 \times 3000) + (4500 + 0.6 \times 5400)/6 = 4.65$ m.
 $(X)(Y)(Z) = 5.4 \text{ m} \times 2.4 \text{ m} \times 4.65 \text{ m} = 60.26 \text{ m}^3$.
 From table, select smallest post having $(X)(Y)(Z)$ of 60.26 or more, and meets the "Z" requirements.

Use two L posts.

$$H_2 = Z + Y/2 + D = 4.65 \text{ m} + 1.2 \text{ m} + 2.7 \text{ m} = 8.55 \text{ m}.$$

$$H_1 = 8.55 - (0.6 \times 5.4 \text{ m})/6 = 8.01 \text{ m}.$$

All dimensions are in millimeters (mm) unless otherwise noted.

Z (m)	Total Sign Area (M ²)					
	Up to 4.7	4.7 to 9.3	9.4 to 13.9	14.0 to 18.6	18.7 to 23.2	23.3 to 26.9
2.7 to 3.7	1.8	1.8	2.1	2.4	2.7	3.1
3.71 to 4.6	1.8	1.8	2.3	2.7	3.1	
4.61 to 5.5	2.1	2.3	2.7			
5.51 to 6.7	2.1	2.4	3.1	Not Permitted		
6.71 to 7.9	2.3	2.6				

Laminated Post Embedment Depth

Laminated Wood Box Posts

Figure 820-4